Adding Structure to Experimentation: FORCEnet Innovation & Research Enterprise F.I.R.E.

Experimentation Management System

Design, Analysis, Assessment and Reporting

Dr. Shelley P. Gallup, Dr. Randy Maule, Dr. Gordon Schacher

Naval Postgraduate School

What's the problem?

- Perceived lack of rigor in experimentation.
- Complex assortment of stakeholders.
- Dynamic nature of programs, initiatives and objectives.
- Planning is not linear.
- Organizational boundaries.
- E-mail is not collaboration, and no way to keep up.
- Project management and status reporting.
- Many inputs to the experiment definition, planning, analysis and reporting process.
- Many expected outputs for the results of experimentation.

What's the solution?

- Enterprise system approach to database design that is integrated with the **tasks** of experiment planning, management, design, execution, analysis and reporting.
- Adopt a **systems-design methodology**, enabled by the enterprise.
- Structured approach **introduces rigor** to the process, and to results.
- Provide a collaborative environment for planning, execution, analysis and reporting.
- Database structure is open via ontology and .xml to import data from other databases, or as input to other databases.
- Supports incremental design improvements to programs of record.

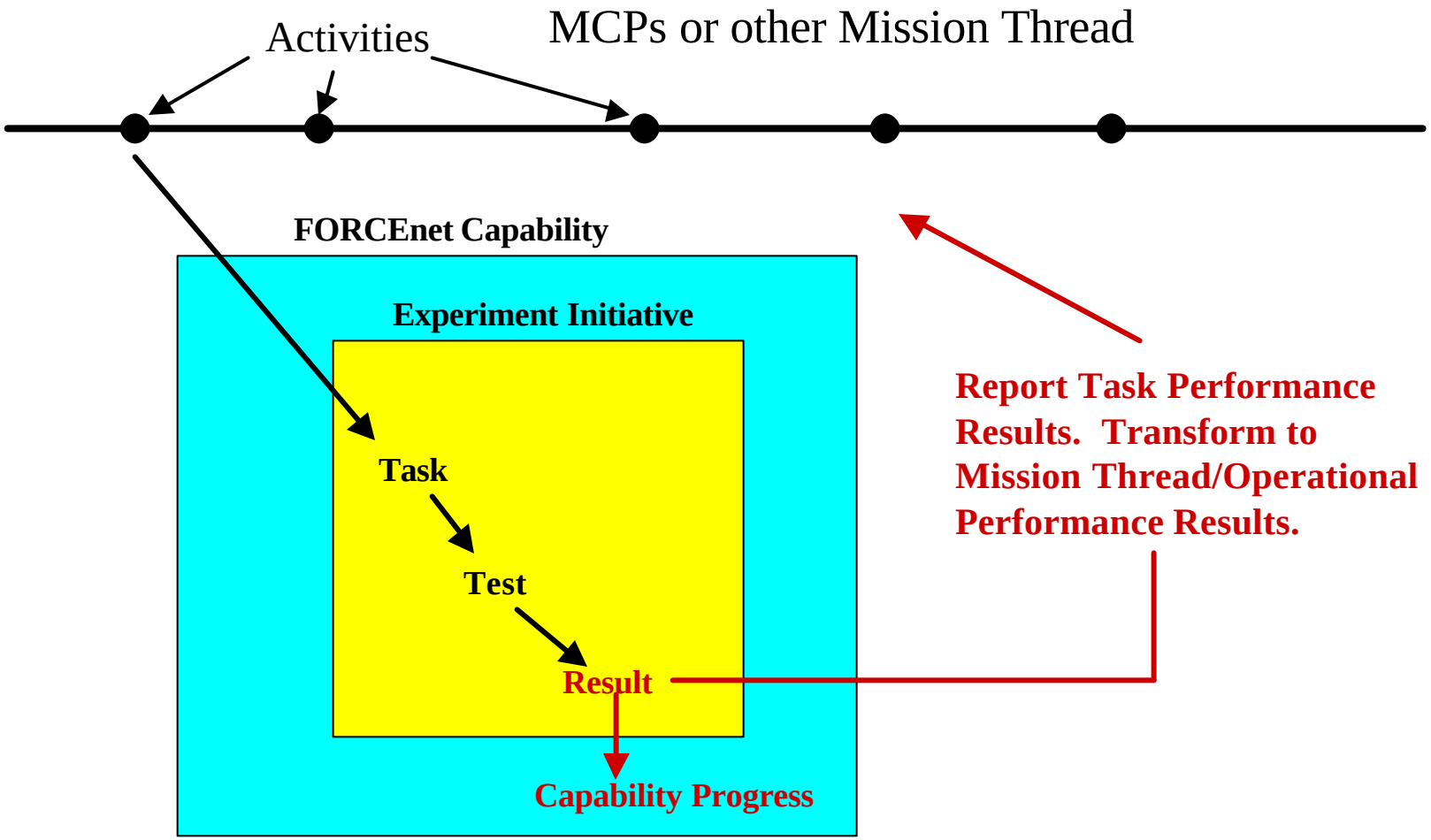
Impact….

- Increase understanding and participation among all planners, summarize info for management, construct threads between objectives, events, data, and results.
- Create a Federated data structure for use throughout the FORCEnet Enterprise.
- Approximately 500 active users.

Past experiment design efforts felt like….

FIRE is an INPUT and RESOURCE

- To Navy Capabilities Development Process (NCDP)
  - FORCEnet Capabilities to attributes to measures mapping
  - Experimentation Results
  - Experimentation Recommendations to Military Utility Assessments
- FORCEnet Integrated Baseline (FIBL)
  - Connection to EDISON for industry input
  - Shared data to FORCEnet Consolidated Compliance Checklist
    - TXC (Technology Exchange Clearinghouse)
    - VKR (Virtual Knowledge Repository)



Relationships between Tasks, their experiment results, and means to roll up to higher levels of interest will all be contained in FIRE.

Providing Results to Other Users
TW to Joint Functional Areas Example

Step1. Produce experiment Objective results.

Step 2. Map results to FORCEnet Capabilities (TW requirement).

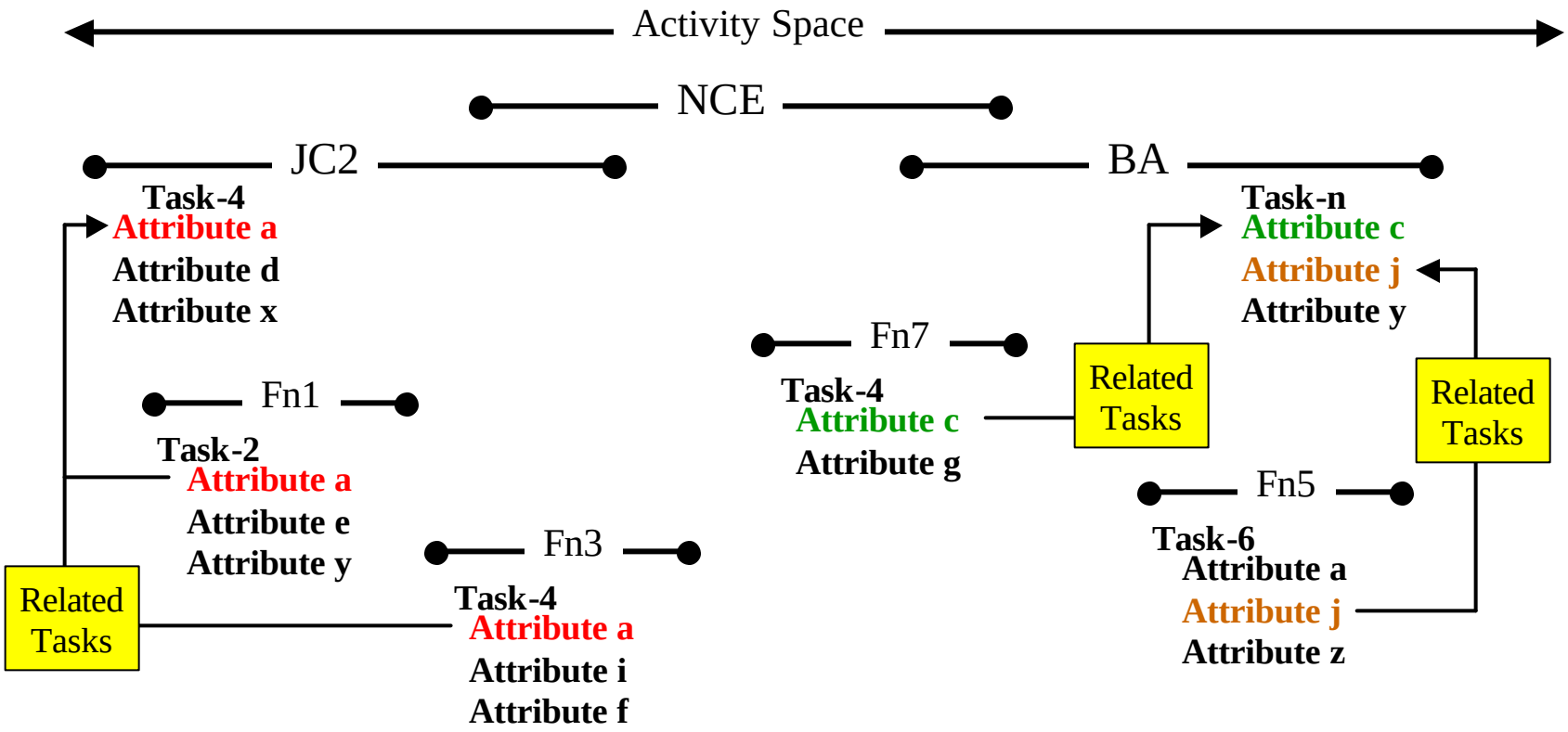
- Objectives/results address FORCEnet functional tasks.
- Results produce Measures for specific Attributes.

Step 3. Match FORCEnet Tasks and Attributes to Joint Tasks and Attributes.

Step 4. Apply Measures scaling, as necessary, to address directly Joint Tasks.

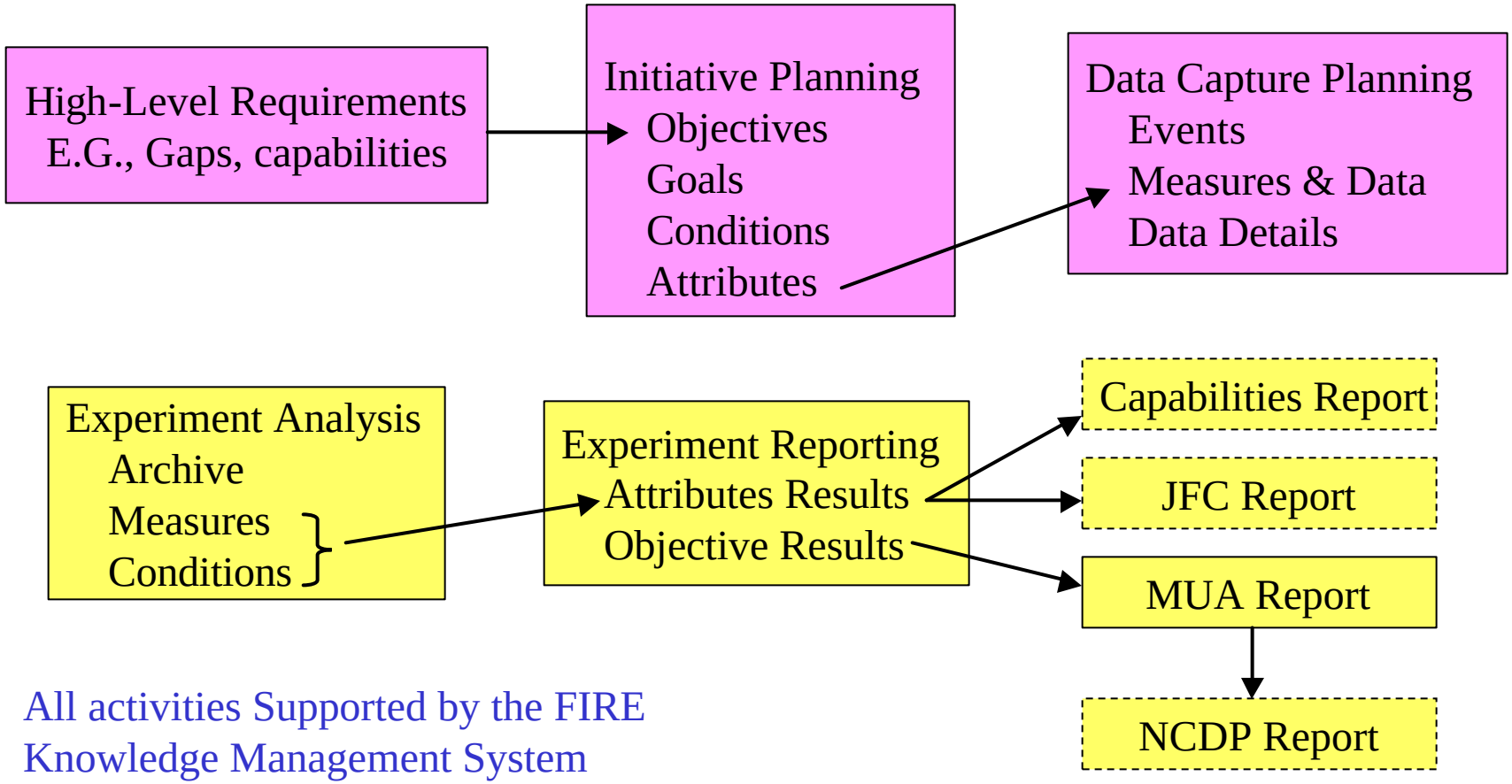
Mapping is provided automatically in F.I.R.E.

Capabilities to Functional Areas



Tasks and Attributes are related but not necessarily exactly the same, interpretation or scaling to the new task may be necessary.

NPS/FORCEnet Experimentation Process

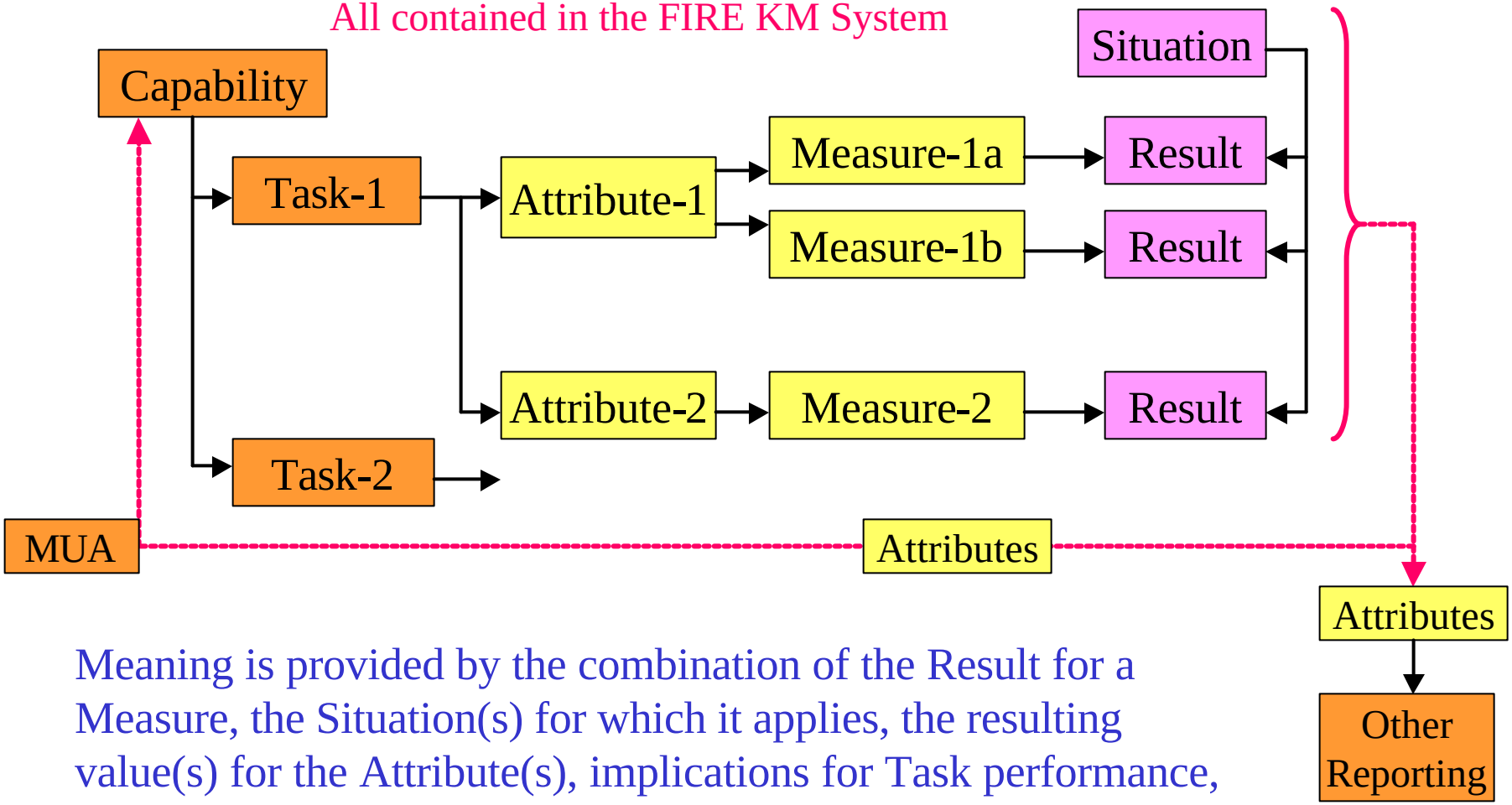


All activities Supported by the FIRE Knowledge Management System

Capabilities and Attribute mapping are keys to tailored reporting for specific interest areas.

Attribute > Result Mapping > Roll-Ups

All contained in the FIRE KM System



Meaning is provided by the combination of the Result for a Measure, the Situation(s) for which it applies, the resulting value(s) for the Attribute(s), implications for Task performance, and the overall contribution to operational Capabilities.

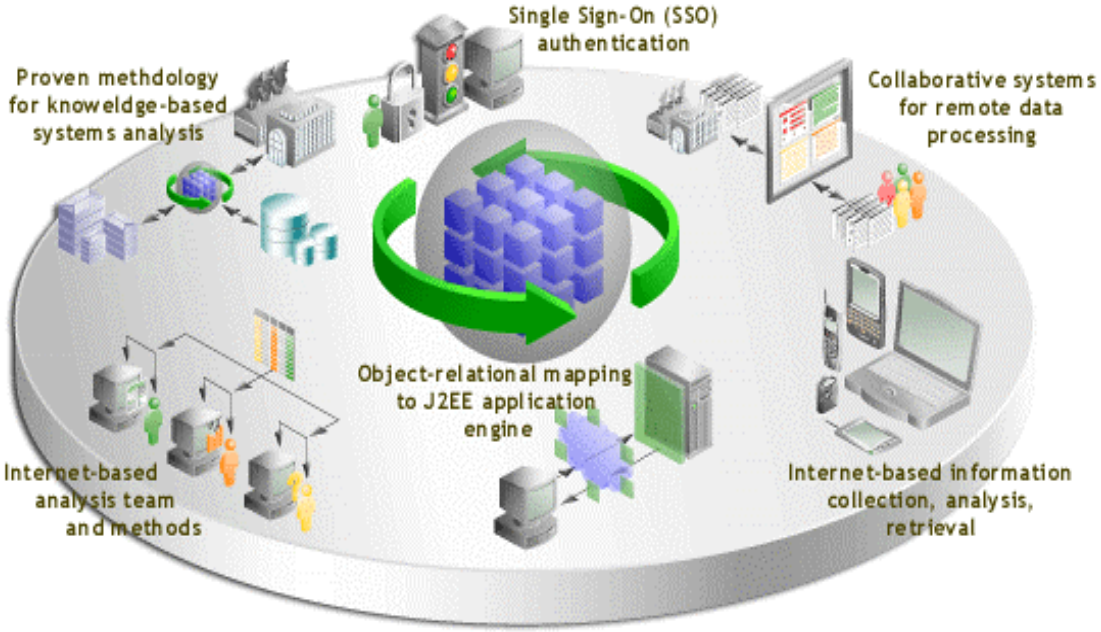
FIRE as Enabler

- Experimentation is a set of closely coordinated and collaborative tasks.
- Each user has a profile that specifies areas of access as a User of FIRE edit functions, or as a viewer of information.
- Oracle Collaborative Tools provide means for desktop sharing, VOIP, instant messaging (not over NMCI) as an alternative to VTCs.
- AI's provide search capabilities within indexed data repository, and data pulled from authorized databases.

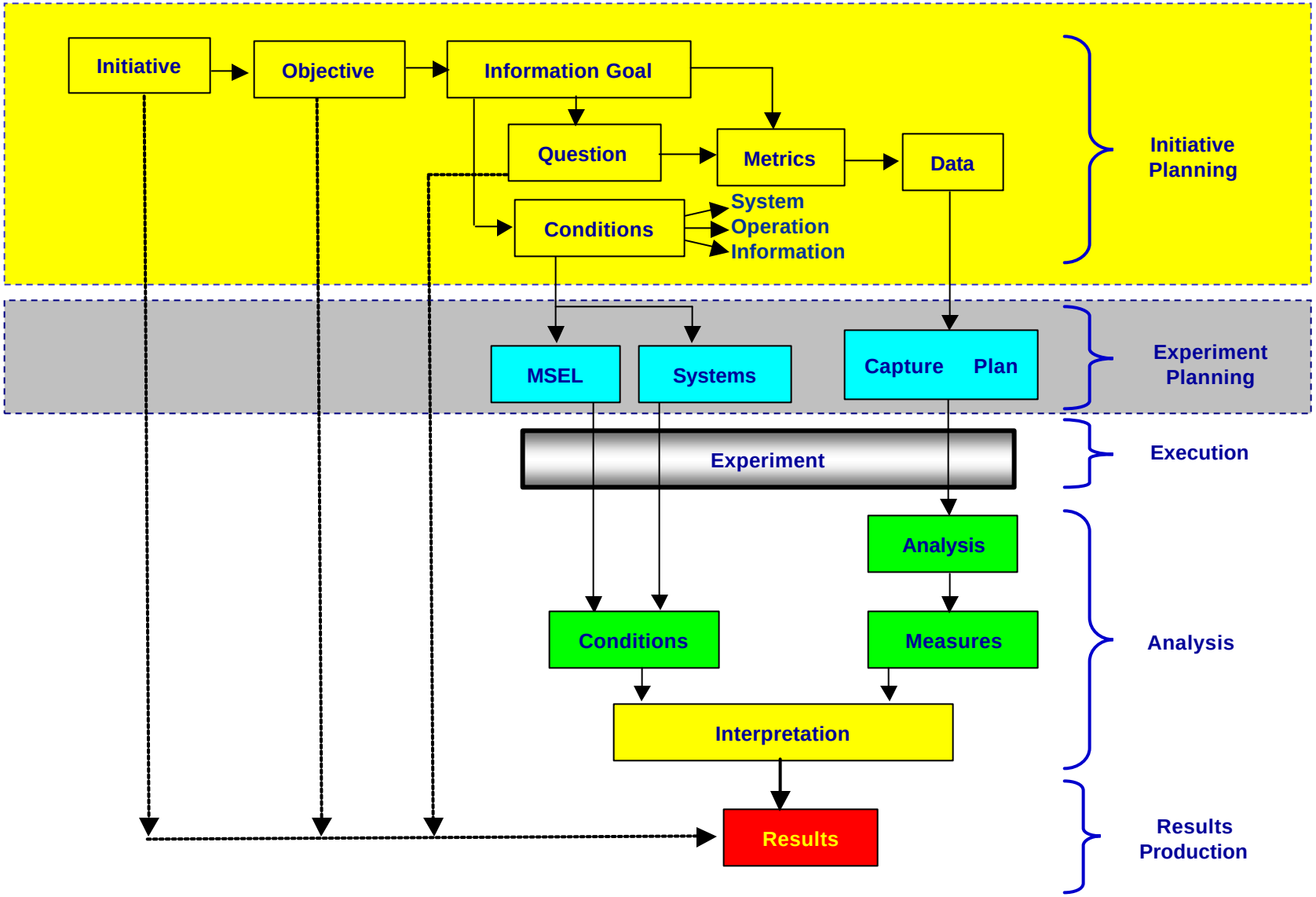
Experimentation Innovation

Oracle 10g based

- First enterprise application to work both NMCI and non-NMCI
- J2EE 1.4 standard industry architecture for portal, web services, SOA, single sign-on, browser-based
- Roll-up summaries from initiatives, data, programs
- Connection between objectives and results is preserved



High Level Task-Flow



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Trident Warrior

13 Step Process

Based on Code of Best Practices for Experimentation (COBPE)

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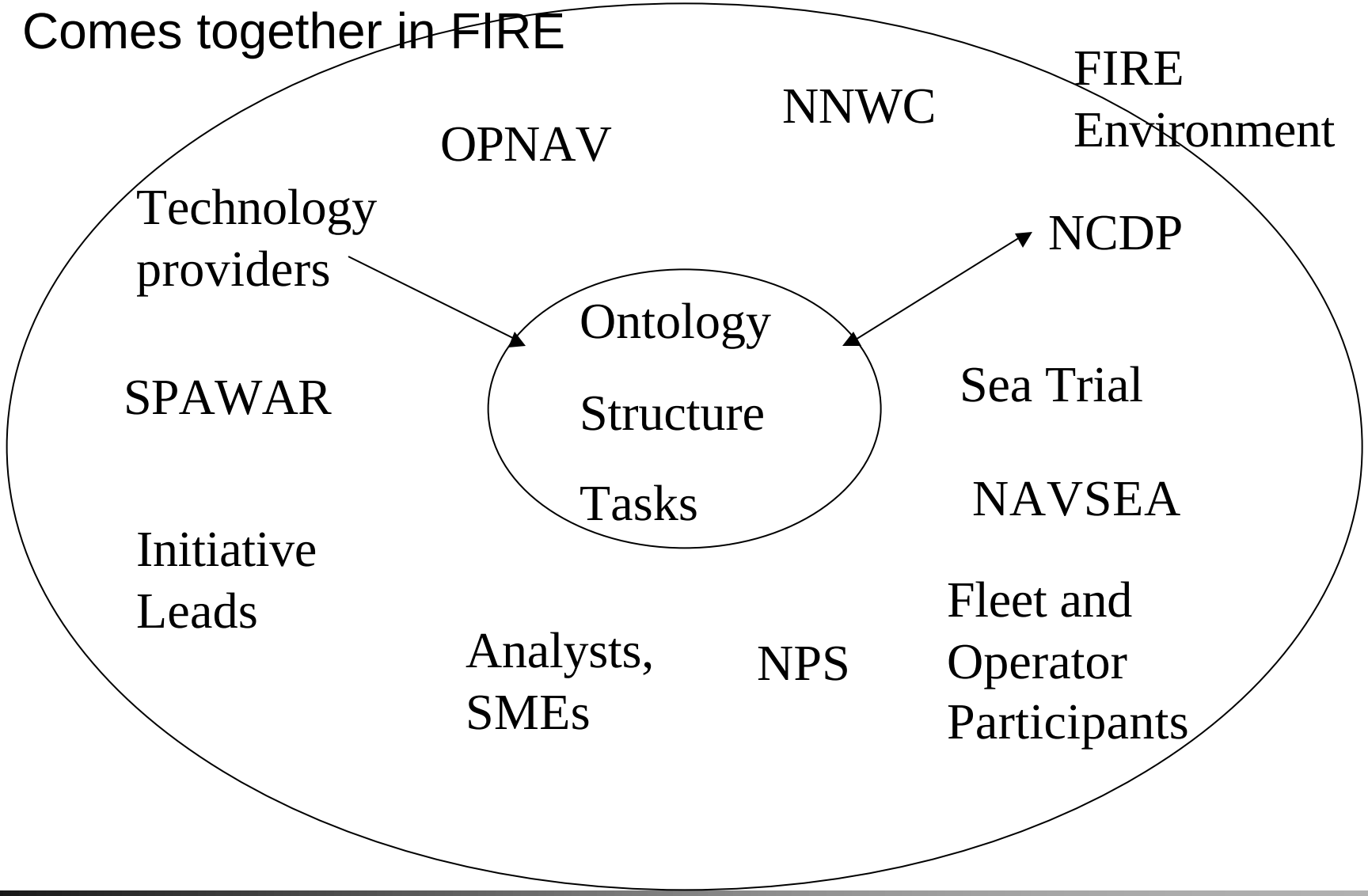
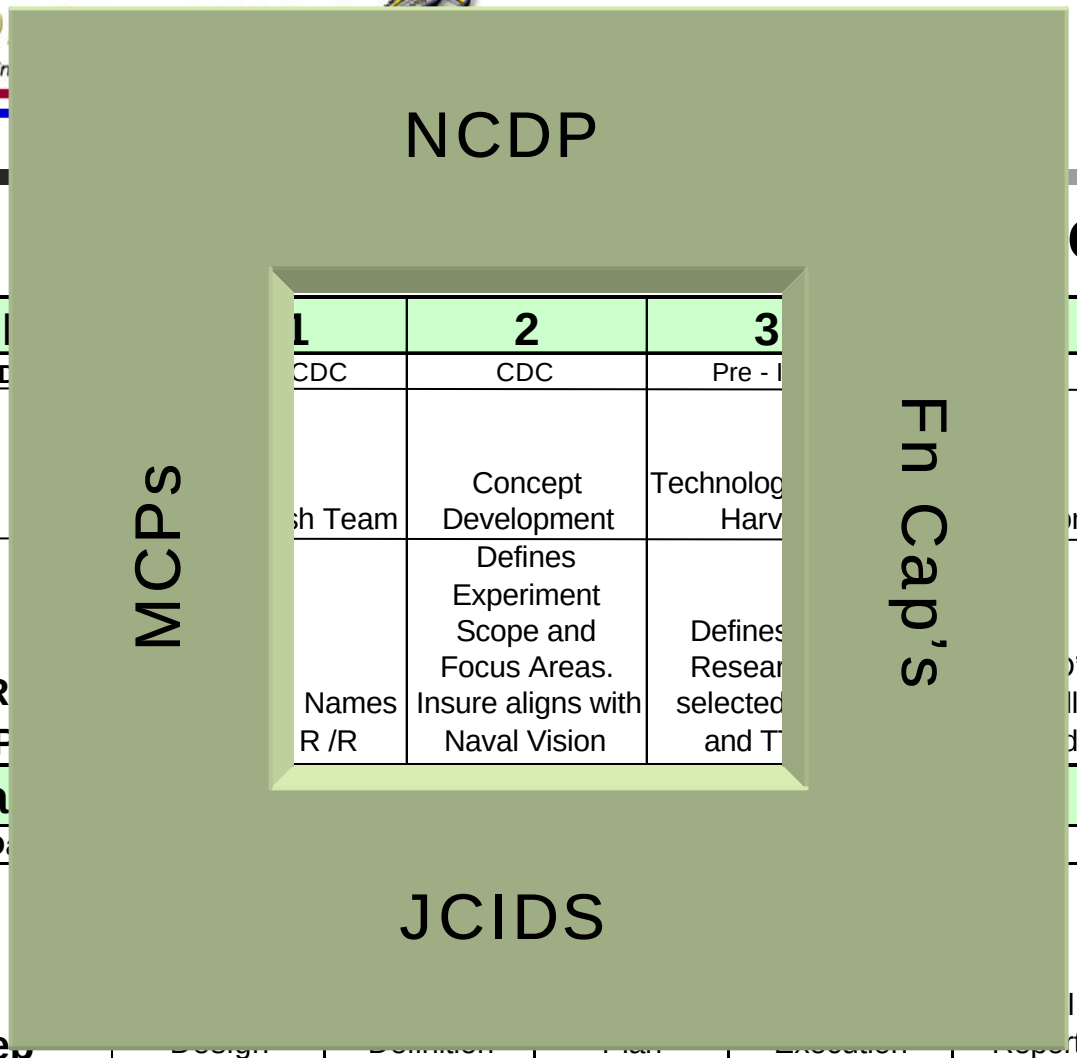
Trident Warrior 13-Step Process

Phase	1	2	3	4	5	6
Due Dates	Pre-CDC	CDC	Pre - IPC	Pre - IPC	Pre - MPC	Pre - MPC
Step	Establish Team	Concept Development	Technology / TTP Harvest	Asset Identification	Develop Experiment Objectives	IDEF / OSD / Process Action Maps
Required Product	Defined Names and R /R	Defines Experiment Scope and Focus Areas. Insure aligns with Naval Vision	Defines and Researches selected Tech and TTPs	Platforms ID'ed and Install Scheduled	Defines the So What and how to measure	Turns the Words into Design Diagrams

Phase	7	8	9	10	11	12	13
Due Dates	Pre - MPC	Pre-FPC	Pre - FPC	TBD	TBD	TBD	TBD
Step	Experiment Design	Event Definition	Data Collection Plan	Execution	Final Report	Assessment OAA	MUA
Required Product	Lays out the Flow and Appicable Scenarios to Meet Objectives	Defines the Detailed execution Plan	Maps the Data to be Collected to the means	Insure Plan is Flexable to changing enviornment	Must be Quick and Good	Necks down Analysis to Assessment	Necks Down Assessment to DOTMLPF Recommendations

Trident Warrior Team….





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EDISON

EDISON

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EDISON

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E.D.I.S.O.N.

Enterprise Database for Innovation and Solutions Network

- Data Mining of potential technology solutions from Industry
- DoD technology solutions (E.g., SPAWAR)

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Trident

Warrior

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Warrior

Trident

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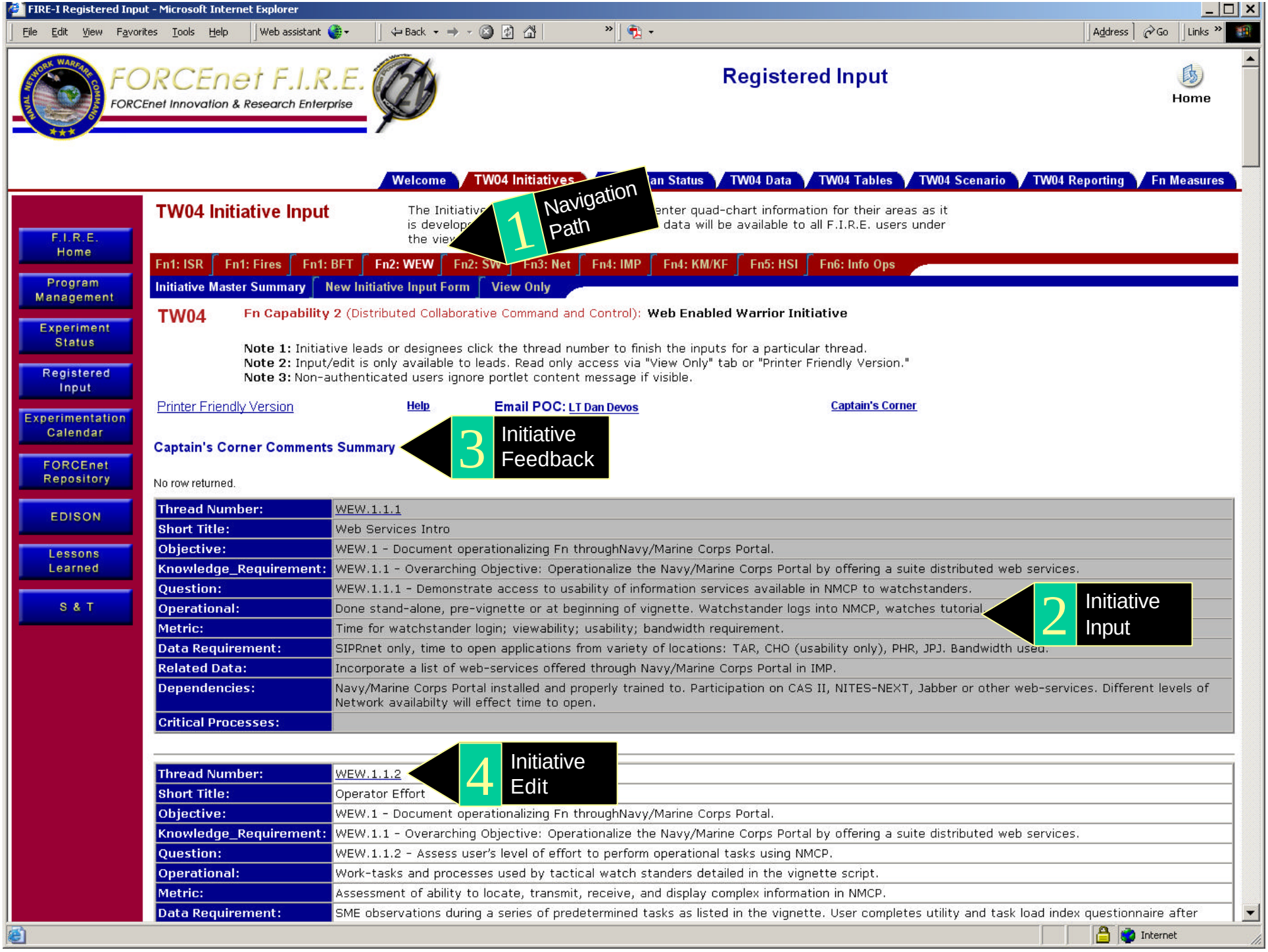
FIRE-I Registered Input - Microsoft Internet Explorer
FORCEnet F.I.R.E.
FORCEnet Innovation & Research Enterprise
Registered Input
Home
Welcome
TW04 Initiatives
TW04 Data
TW04 Tables
TW04 Scenario
TW04 Reporting
Fn Measures
F.I.R.E. Home
Program Management
Experiment Status
Registered Input
Experimentation Calendar
FORCEnet Repository
EDISON
Lessons Learned
S & T
TW04 Initiative Input
1 Navigation Path
Fn1: ISR
Fn1: Fires
Fn1: BFT
Fn2: WEW
Fn2: SW
Fn3: Net
Fn4: IMP
Fn4: KM/KF
Fn5: HSI
Fn6: Info Ops
Initiative Master Summary
New Initiative Input Form
View Only
TW04
Fn Capability 2 (Distributed Collaborative Command and Control): Web Enabled Warrior Initiative
Note 1: Initiative leads or designees click the thread number to finish the inputs for a particular thread.
Note 2: Input/edit is only available to leads. Read only access via "View Only" tab or "Printer Friendly Version."
Note 3: Non-authenticated users ignore portlet content message if visible.
Printer Friendly Version
Help
Email POC: LT Dan Devos
Captain's Corner
Captain's Corner Comments Summary
3 Initiative Feedback
No row returned.
Thread Number: WEW.1.1.1
Short Title: Web Services Intro
Objective: WEW.1 - Document operationalizing Fn throughNavy/Marine Corps Portal.
Knowledge_Requirement: WEW.1.1 - Overarching Objective: Operationalize the Navy/Marine Corps Portal by offering a suite distributed web services.
Question: WEW.1.1.1 - Demonstrate access to usability of information services available in NMCP to watchstanders.
Operational: Done stand-alone, pre-vignette or at beginning of vignette. Watchstander logs into NMCP, watches tutorial.
2 Initiative Input
Metric: Time for watchstander login; viewability; usability; bandwidth requirement.
Data Requirement: SIPRnet only, time to open applications from variety of locations: TAR, CHO (usability only), PHR, JPJ. Bandwidth used.
Related Data: Incorporate a list of web-services offered through Navy/Marine Corps Portal in IMP.
Dependencies: Navy/Marine Corps Portal installed and properly trained to. Participation on CAS II, NITES-NEXT, Jabber or other web-services. Different levels of Network availabilty will effect time to open.
Critical Processes:
Thread Number: WEW.1.1.2
4 Initiative Edit
Short Title: Operator Effort
Objective: WEW.1 - Document operationalizing Fn throughNavy/Marine Corps Portal.
Knowledge_Requirement: WEW.1.1 - Overarching Objective: Operationalize the Navy/Marine Corps Portal by offering a suite distributed web services.
Question: WEW.1.1.2 - Assess user's level of effort to perform operational tasks using NMCP.
Operational: Work-tasks and processes used by tactical watch standers detailed in the vignette script.
Metric: Assessment of ability to locate, transmit, receive, and display complex information in NMCP.
Data Requirement: SME observations during a series of predetermined tasks as listed in the vignette. User completes utility and task load index questionnaire after
Internet

Initiative to objective level (TW05/06)

- Thread # (primary key)
- Short title for the objective
- Objective statement
- Question or proposal
- Operational condition required
- System condition required
- Information condition required
- Attributes

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Questions

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Data Level Planning

- Thread # (Primary Key)
- Attributes: specific measures
- Areas for data types
  - System data (digital data, technology derived data)
  - Observation data (logs, chat files)
  - Qualitative data
- Instruments linked to data requirement
- Automation of a draft Data collection plan

Phase	1	2	3	4	5	6
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Data

Collection

Collection

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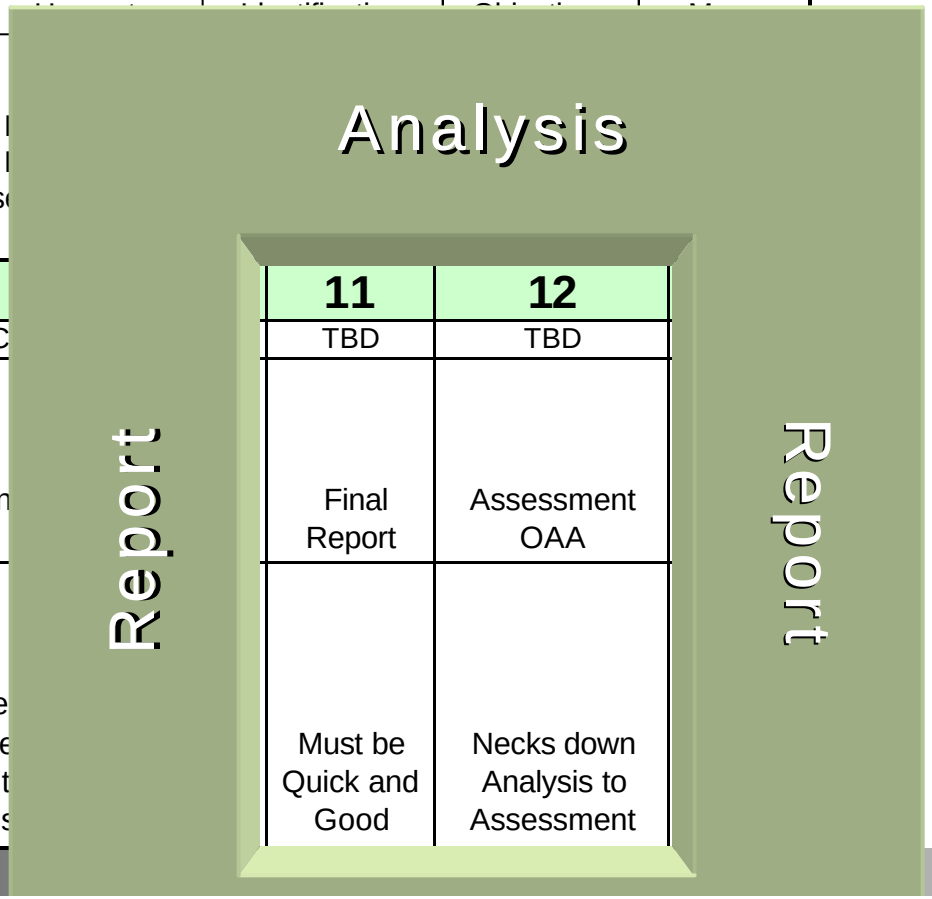

Summaries of Results

- First level summary derived from data, answers questions posed at the objective level.
- Second level summary combines objective summaries within an initiative area to construct a single high level summary of the initiative
- Summary results used in higher level reporting (OAA and MUA).

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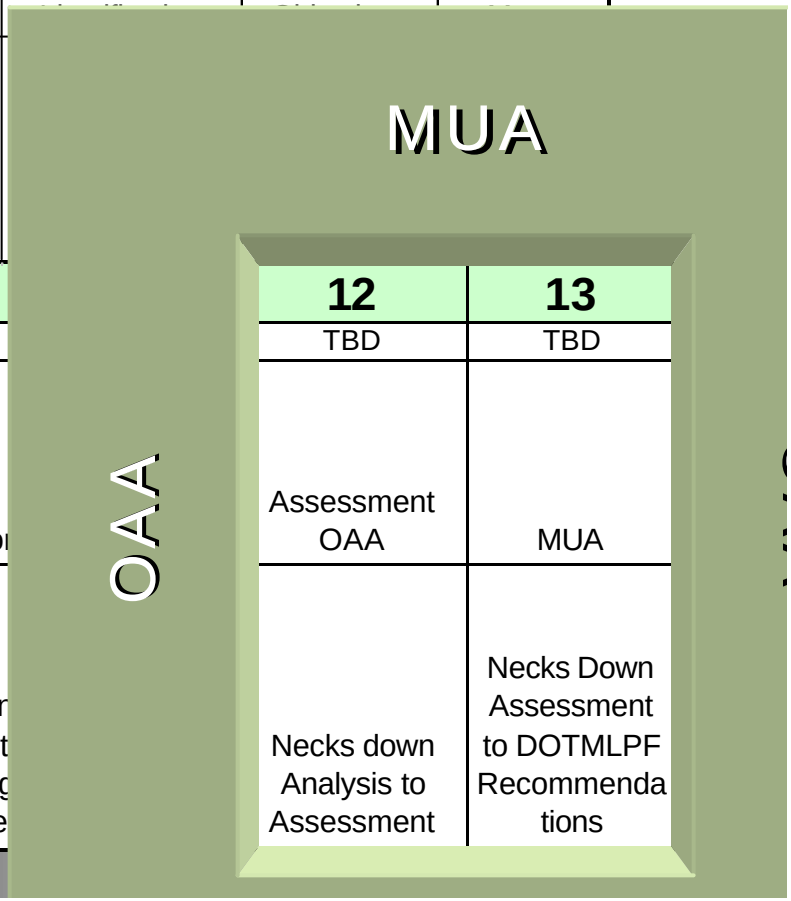

FIRE - MUA - Microsoft Internet Explorer

Address Go File Edit View Favorites Tools Help Links

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Military Utility Assessment

Password Home

Welcome | OAA/MUA Forms

Home
MUA
TW04
TW05
Calendar
Repository
EDISON
Lessons
S&T
Collaboration
Survey

TW04 OAA/MUA Forms. Initial input is done under the Input Form tab, viewing of current information under the Report tab, and editing under the Report tab. Printing is best done using Print Version link on the Report page.

The links immediately below provide access to the TW04 Initiative source information for the results presented here.

TW04 ISR Initiative Master Summary
TW04 SW Initiative Master Summary
TW04 HSI Initiative Master Summary
TW04 Fires Initiative Master Summary
TW04 Networks Initiative Master Summary
TW04 Info Ops Initiative Master Summary
TW04 BFT Initiative Master Summary
TW04 IMP Initiative Master Summary
TW04 WEW Initiative Master Summary
TW04 KM/KF Initiative Master Summary

Fn1: ISR | Fn1: Fires | Fn1: BFT | Fn2: WEW | Fn2: SW | Fn3: Net | Fn4: IMP | Fn4: KM/KF | Fn5: HSI | Fn6: Info Ops

Input Form | Report

Result Number	TW04.KM.1
Point of Contact	Shelley Gallup
Email Address	spgallup@nps.navy.mil
Phone Number	831 656 1040
Source Threads	KF.1.1.1
Additional Source Threads	
Purpose	Develop a methodology to document knowledge gaps that emerge from implementing new Fn capabilities, and means to treat those gaps.
Observation Location	USS TARAWA
Observation Venue	TW04
Result	• As mentors and knowledge resources (treatments) were used, situational awareness increased. • Watchstanders relied on treatments to fill gaps in the following priority: mentor, GCCS-M COP and chat. Instance of chat used to complete knowledge gaps was low-only 3 instances. No instances of IMP use to fill knowledge gaps were recorded. • Of the three principle knowledge treatments used, use of GCCS-M is the highest predictor of situational awareness (higher SA correlates to dependence on GCCS-M).
Comments	the data here indicate that knowledge flows can be determined, and their relative utility stated by employing pre-assessed Knowledge Inventory, measures of situational awareness, and by having self-determined level of ignorance. For analysis, ground-truth data is required in order to determine watchstander performance.
DOTMLPF Recommendation	
Doctrine	
Organization	
Training	An intrinsic element to knowledge is the inventory which watchstanders bring to their tasks. The inventory of knowledge is shown to have a very large impact on watchstander performance.

Done Internet

FIRE—Future…..NTIRA

Federate the family of authoritative databases to perform multiple tasks

Examples:

Objectives….defined in FIRE……run in NTIRA for validation and pre-experiment analysis

Post experiment analysis……produces improved metrics…….provided back to NTIRA for improved model parameters

FIRE—Future…..DARS

Architectures in the DoD Architecture Repository System (DARS)

Imported into FIRE as notional model of objectives (IDEF and OSDs translate to OVs, TVs used for technical objectives).

Experimentation adjusts notional models to produce “experimentation architectures” and added back to DARS

FIRE—Future…..FIBL & FCCC

Fn Capabilities

- tasks
- attributes
- measures

Vetted in experimentation

Become part of the FCCC and FIBL process

FIRE—Future…..EDISON

Shared databases between Virtual Knowledge Repository, Technology Exchange Clearinghouse and FIRE

- Make the technologies solutions available in industry part of experimentation

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Conclusion

FIRE provides:

- **A FORCEnet I&E environment for experimentation**
- **Connections between High level concepts, Joint Functional Concepts, FORCEnet Functional Concepts, NCDP to experiment objectives, data (attributes associated to Fn Capabilities), results and recommendations.**
- **A collaborative environment in which experiment planning tasks are conducted by all participants**
- **An additional database that connects experimentation with other authoritative databases for acquisition (NTIRA) and regulation (FIBL).**

Contact

•Dr. Shelley Gallup: spgallup@nps.navy.mil
831 656 1040

•Dr. Randy Maule: rwmaule@nps.navy.mil
831 656 3741

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